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*Supplement of*

## **A multi-sensor satellite-based archive of the largest SO<sub>2</sub> volcanic eruptions since 2006**

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## SUPPLEMENT

### DAILY FILE

Volcanic clouds' archive for volcanic eruptions with VEI  $\geq 4$  according to the Global Volcanism Program of Smithsonian in the period 2006-2018. Archive of SO<sub>2</sub> retrievals from AIRS, IASI (A&B), GOME-2 (A&B) sensors, CALIOP tracks and RO profiles collocated with the volcanic cloud.

STRUCTURE OF THE NC FILE.  
ONE NC FILE PER DAY.

dimensions:

AIRS\_lat = max number of rows for lat lon and SO<sub>2</sub> of AIRS, corresponding to the maximum number of data point in one granule.

date\_AIRS = max number of columns corresponding to the number of granules for AIRS files

IASI\_lat = max number of rows for lat lon SO<sub>2</sub> height, corresponding to the maximum number of data point in one scanning step.

date\_IASI = max number of columns for lat lon SO<sub>2</sub> and datetime of IASI corresponding to the number of scanning steps.

GOME\_lat = max number of rows for lat lon SO<sub>2</sub> height corresponding to the maximum number of data point in one scanning step.

date\_GOME = dimension of datetime for GOME-2 files (composite GOME-2 A&B) corresponding to the number of scanning steps.

CALIOP\_lat = max number of rows for lat lon datetime height of volcanic cloud (VC), type of VC and filename for CALIOP files

CALIOP\_char = filename maximum number of characters.

CALIOP\_char2 = maximum number of characters to indicate the type of aerosols present at a given altitude range.

CALIOP\_type = to the three sections corresponding to the three levels of altitude -0.5 to 8.2 km, 8.2 to 20.2 km and 20.2 to 30.1 km considered.

Sensors = number of collocated sensors

RO\_AIRS\_lat = num rows for lat, lon, date, bending angle, anomaly bending angle, temperature, pressure, refractivity, specific humidity, height VC, corresponding to the length of a profile.

RO\_AIRS\_profile = num of columns, corresponding to the number of profiles.

RO\_IASI\_lat = num rows for lat, lon, date, bending angle, anomaly bending angle, temperature, pressure, refractivity, specific humidity, height VC, corresponding to the length of a profile.

RO\_IASI\_profile = num of columns, corresponding to the number of profiles.

RO\_GOME\_lat = num rows for lat, lon, date, bending angle, anomaly bending angle, temperature, pressure, refractivity, specific humidity, height VC, corresponding to the length of a profile.

RO\_GOME\_profile = num of columns, corresponding to the number of profiles.

variables:

**--AIRS--**

```
double AIRS_lat(AIRS_lat, date_AIRS);
```

```
:standard_name = "latitude";
```

```
:long_name = "Latitude of AIRS acquisition";
```

```
:units = "degrees_north";
```

```
:_CoordinateAxisType = "Lat";
```

```
:_FillValue = -9999.0; // double
```

```
double AIRS_lon(AIRS_lat, date_AIRS);
```

```
:standard_name = "longitude";
```

```
:long_name = "Longitude of AIRS acquisition";
```

```
:units = "degrees_east";
```

```
:_CoordinateAxisType = "Lon";
```

```
:_FillValue = -9999.0; // double
```

```
int AIRS_date(date_AIRS);
```

```
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of AIRS granule";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";
```

```
double AIRS_SO2(AIRS_lat, date_AIRS);
:standard_name = "so2_airs";
:long_name = "SO2 AIRS partial columns";
:units = "DU";
:_FillValue = -9999.0; // double
```

#### **--IASI--**

```
double IASI_lat(IASI_lat, date_IASI);
:standard_name = "latitude";
:long_name = "Latitude of IASI acquisition (composite IASI A&B)";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double
```

```
double IASI_lon(IASI_lat, date_IASI);
:standard_name = "longitude";
:long_name = "Longitude of IASI acquisition (composite IASI A&B)";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double
```

```
int IASI_date(date_IASI);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of IASI A&B track";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";
```

```
double IASI_SO2(IASI_lat, date_IASI);
:standard_name = "so2_iasi";
:long_name = "SO2 vertical column density IASI A&B interpolated";
:units = "DU";
:_FillValue = -9999.0; // double
```

```
double IASI_height (IASI_lat, date_IASI)
:standard_name = "height_at_effective_cloud_top_defined_by_infrared_radiation";
:long_name = "Height of the VC automatic retrieval on IASI A&B";
:note = "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double
```

#### **--GOME-2--**

```
double GOME_lat(GOME_lat, date_GOME);
:standard_name = "latitude";
:long_name = "Latitude of GOME-2 acquisition (composite GOME-2 A&B)";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double
```

```

double GOME_lon(GOME_lat, date_GOME);
:standard_name = "longitude";
:long_name = "Longitude of GOME-2 acquisition (composite GOME-2 A&B)";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

int GOME_date(date_GOME);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of GOME-2 A&B track";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

double GOME_SO2_1(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_low_troposphere";
:long_name = "SO2 vertical column density GOME-2 A&B low troposphere (2.5 km)";
:units = "DU";
:_FillValue = -9999.0; // double

double GOME_SO2_2(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_mid_troposphere";
:long_name = "SO2 vertical column density GOME-2 A&B mid troposphere (6 km)";
:units = "DU";
:_FillValue = -9999.0; // double

double GOME_SO2_3(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_low_stratosphere";
:long_name = "SO2 vertical column density GOME-2 A&B low stratosphere (15 km)";
:units = "DU";
:_FillValue = -9999.0; // double

--CALIOP--
double CALIOP_lat(CALIOP_lat);
:standard_name = "latitude";
:long_name = "Latitude of CALIOP trajectory";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double

double CALIOP_lon(CALIOP_lat);
:standard_name = "longitude";
:long_name = "Longitude of CALIOP trajectory";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

Int CALIOP_date (CALIOP_lat);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of CALIOP trajectory";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

char CALIOP_filename (CALIOP_lat, CALIOP_char);

```

```
:standard_name = "filenamecal";
:long_name = "Name of CALIOP file";
```

```
double CALIOP_height (CALIOP_lat, Sensors)
:standard_name = "height_at_cloud_top";
:long_name = "Height of the VC automatic retrieval on CALIOP backscatter";
:note= "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double
```

```
double CALIOP_type (CALIOP_lat, CALIOP_char2, CALIOP_type)
:standard_name = "status_flag";
:long_name = "Type of the VC retrieved from the CALIOP Vertical Feature Mask";
:flag_values = 2, 6, 9, 10
:flag_meaning = "2=dust 6=elevated_smoke 9=volcanic_ash 10=sulfate/other"
```

#### --RADIO OCCULTATIONS--

```
double RO_AIRS_lat(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "latitude";
:long_name = "Tangent point latitude of RO profile collocated with AIRS";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double
```

```
double RO_AIRS_lon(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "longitude";
:long_name = "Tangent point longitude of RO profile collocated with AIRS";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double
```

```
int RO_AIRS_date (RO_AIRS_lat, RO_AIRS_profile);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of RO profile collocated with AIRS";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";
```

```
double RO_AIRS_bending_angle(RO_AIRS_lat, RO_AIRS_profile);
:long_name = "Ionospheric corrected non-optimized bending angle of profiles collocated with AIRS";
:units = "rad";
:_FillValue = -9999.0; // double
```

```
double RO_AIRS_anomaly_bending_angle(RO_AIRS_lat, RO_AIRS_profile);
:long_name = "Bending angle anomaly of profiles collocated with AIRS";
:units = "percent";
:_FillValue = -9999.0; // double
```

```
double RO_AIRS_temperature(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "air_temperature";
:long_name = "Air temperature profiles";
:units = "K";
:_FillValue = -9999.0; // double
```

```
double RO_AIRS_pressure(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "air_pressure";
```

```

:long_name = "Air pressure profiles";
:units = "Pa";
:_FillValue = -9999.0; // double

double RO_AIRS_refractivity(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "refractivity";
:long_name = "Refractivity (N-units) profiles";
:units = "1";
:_FillValue = -9999.0; // double

double RO_AIRS_specific_humidity(RO_AIRS_lat, RO_AIRS_profile);
:standard_name = "specific_humidity";
:long_name = "Specific humidity profiles";
:units = "kg kg**-1";
:_FillValue = -9999.0; // double

double RO_AIRS_heightVC(RO_AIRS_profile)
:standard_name = "height_at_cloud_top";
:long_name = "Height of the VC automatic retrieval on RO bending angle anomaly";
:note = "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double

double RO_IASI_lat(RO_IASI_lat, RO_IASI_profile);
:standard_name = "latitude";
:long_name = "Tangent point latitude of RO profile collocated with IASI";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double

double RO_IASI_lon(RO_IASI_lat, RO_IASI_profile);
:standard_name = "longitude";
:long_name = "Tangent point longitude of RO profile collocated with IASI";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

int RO_IASI_date(RO_IASI_lat, RO_IASI_profile);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of RO profile collocated with IASI";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

double RO_IASI_bending_angle(RO_IASI_lat, RO_IASI_profile);
:long_name = "Ionospheric corrected non-optimized bending angle of profile collocated with IASI";
:units = "rad";
:_FillValue = -9999.0; // double

double RO_IASI_anomaly_bending_angle(RO_IASI_lat, RO_IASI_profile);
:long_name = "Bending angle anomaly of profile collocated with IASI";
:units = "percent";
:_FillValue = -9999.0; // double

double RO_IASI_temperature(RO_IASI_lat, RO_IASI_profile);
:standard_name = "air_temperature";

```

```

:long_name = "Air temperature profiles";
:units = "K";
:_FillValue = -9999.0; // double

double RO_IASI_pressure(RO_IASI_lat, RO_IASI_profile);
:standard_name = "air_pressure";
:long_name = "Air pressure profiles";
:units = "Pa";
:_FillValue = -9999.0; // double

double RO_IASI_refractivity(RO_IASI_lat, RO_IASI_profile);
:standard_name = "refractivity";
:long_name = "Refractivity (N-units) profiles";
:units = "1";
:_FillValue = -9999.0; // double

double RO_IASI_specific_humidity(RO_IASI_lat, RO_IASI_profile);
:standard_name = "specific_humidity";
:long_name = "Specific humidity profiles";
:units = "kg kg**-1";
:_FillValue = -9999.0; // double

double RO_IASI_heightVC(RO_IASI_profile)
:standard_name = "height_at_cloud_top";
:long_name = "Height of the VC automatic retrieval on RO bending angle anomaly";
:note = "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double

double RO_GOME_lat(RO_GOME_lat, RO_GOME_profile);
:standard_name = "latitude";
:long_name = "Tangent point latitude of RO profile collocated with GOME-2";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double

double RO_GOME_lon(RO_GOME_lat, RO_GOME_profile);
:standard_name = "longitude";
:long_name = "Tangent point longitude of RO profile collocated with GOME-2";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

int RO_GOME_date(RO_GOME_lat, RO_GOME_profile);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of RO profile collocated with GOME-2";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

double RO_GOME_bending_angle(RO_GOME_lat, RO_GOME_profile);
:long_name = "Ionospheric corrected non-optimized bending angle of profile collocated with GOME-2";
:units = "rad";
:_FillValue = -9999.0; // double

double RO_GOME_anomaly_bending_angle(RO_GOME_lat, RO_GOME_profile);

```

```
:long_name = "Bending angle anomaly of profile collocated with GOME-2";
:units = "percent";
:_FillValue = -9999.0; // double
```

```
double RO_GOME_temperature(RO_GOME_lat, RO_GOME_profile);
:standard_name = "air_temperature";
:long_name = "Air temperature profiles";
:units = "K";
:_FillValue = -9999.0; // double
```

```
double RO_GOME_pressure(RO_GOME_lat, RO_GOME_profile);
:standard_name = "air_pressure";
:long_name = "Air pressure profiles";
:units = "Pa";
:_FillValue = -9999.0; // double
```

```
double RO_GOME_refractivity(RO_GOME_lat, RO_GOME_profile);
:standard_name = "refractivity";
:long_name = "Refractivity (N-units) profiles";
:units = "1";
:_FillValue = -9999.0; // double
```

```
double RO_GOME_specific_humidity (RO_GOME_lat, RO_GOME_profile);
:standard_name = "specific_humidity";
:long_name = "Specific humidity profiles";
:units = "kg kg**-1";
:_FillValue = -9999.0; // double
```

```
double RO_GOME_heightVC(RO_GOME_profile)
:standard_name = "height_at_cloud_top";
:long_name = "Height of the VC automatic retrieval on RO bending angle anomaly";
:note = "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double
```

## METADATA/Attributes

### Reference to literature

```
:volcano_name; // char
:VEI; // char
:eruption_start_day; // char
:eruption_end_day; // char
:volcano_lat; // char
:volcano_lon; // char
:retrieval_algorithm_AIRS; // char
:reference_1_AIRS; // char
:retrieval_algorithm_IASI; // char
:reference_1_IASI; // char
:reference_2_IASI; // char
:retrieval_algorithm_GOME; // char
:reference_1_GOME; // char
:reference_2_GOME; // char
```



## VOLCANO FILE

Volcanic clouds' archive for volcanic eruptions with VEI  $\geq 4$  according to the Global Volcanism Program of Smithsonian in the period 2006-2018. Archive of SO<sub>2</sub> retrievals from AIRS, IASI (A&B), GOME-2 (A&B) sensors, CALIOP tracks and RO profiles collocated with the volcanic cloud.

STRUCTURE OF THE NC FILE.  
ONE NC FILE PER VOLCANO.

dimensions:

AIRS\_lat = max number of rows for lat lon and SO<sub>2</sub> of AIRS, corresponding to the maximum number of data point in one granule.

date\_AIRS = max number of columns corresponding to the number of granules for AIRS files

IASI\_lat = max number of rows for lat lon SO<sub>2</sub> height, corresponding to the maximum number of data point in one scanning step.

date\_IASI = max number of columns for lat lon SO<sub>2</sub> and datetime of IASI corresponding to the number of scanning steps.

GOME\_lat = max number of rows for lat lon SO<sub>2</sub> height corresponding to the maximum number of data point in one scanning step.

date\_GOME = dimension of datetime for GOME-2 files (composite GOME-2 A&B) corresponding to the number of scanning steps.

CALIOP\_lat = max number of rows for lat lon datetime height of VC, type of VC and filename for CALIOP files

CALIOP\_char = filename maximum number of characters.

CALIOP\_char2 = maximum number of characters to indicate the type of aerosols present at a given altitude range.

CALIOP\_type = to the three sections corresponding to the three levels of altitude -0.5 to 8.2 km, 8.2 to 20.2 km and 20.2 to 30.1 km considered.

Sensors = number of collocated sensors

RO\_lat = num rows for lat, lon, date, bending angle, anomaly bending angle, temperature, pressure, refractivity, specific humidity, height VC, corresponding to the length of a profile.

RO\_profile = num of columns, corresponding to the number of profiles.

variables:

**--AIRS--**

```
double AIRS_lat(AIRS_lat, date_AIRS);
```

```
:standard_name = "latitude";
```

```
:long_name = "Latitude of AIRS acquisition";
```

```
:units = "degrees_north";
```

```
:_CoordinateAxisType = "Lat";
```

```
:_FillValue = -9999.0; // double
```

```
double AIRS_lon(AIRS_lat, date_AIRS);
```

```
:standard_name = "longitude";
```

```
:long_name = "Longitude of AIRS acquisition";
```

```
:units = "degrees_east";
```

```
:_CoordinateAxisType = "Lon";
```

```
:_FillValue = -9999.0; // double
```

```
int AIRS_date(date_AIRS);
```

```
:standard_name = "time";
```

```
:long_name = "Datetime of AIRS granule";
```

```
:_CoordinateAxisType = "Time";
```

```
:units = "seconds since 1970-01-01 00:00:0.0";
```

```
:_FillValue = -9999; // int
```

```
:calendar="standard";
```

```
double AIRS_SO2(AIRS_lat, date_AIRS);
```

```
:standard_name = "so2_airs";
```

```
:long_name = "SO2 AIRS partial columns";
:units = "DU";
:_FillValue = -9999.0; // double
```

#### **--IASI--**

```
double IASI_lat(IASI_lat, date_IASI);
:standard_name = "latitude";
:long_name = "Latitude of IASI acquisition (composite IASI A&B)";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double
```

```
double IASI_lon(IASI_lat, date_IASI);
:standard_name = "longitude";
:long_name = "Longitude of IASI acquisition (composite IASI A&B)";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double
```

```
int IASI_date(date_IASI);
:standard_name = "time";
:long_name = "Datetime of IASI A&B track";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";
:_FillValue = -9999; // int
```

```
double IASI_SO2(IASI_lat, date_IASI);
:standard_name = "so2_iasi";
:long_name = "SO2 vertical column density IASI A&B interpolated";
:units = "DU";
:_FillValue = -9999.0; // double
```

```
double IASI_height (IASI_lat, date_IASI)
:standard_name = "height_at_effective_cloud_top_defined_by_infrared_radiation";
:long_name = "Height of the VC automatic retrieval on IASI A&B";
:note = "m from geoid surface";
:units="m";
:_FillValue = -9999.0; // double
```

#### **--GOME-2--**

```
double GOME_lat(GOME_lat, date_GOME);
:standard_name = "latitude";
:long_name = "Latitude of GOME-2 acquisition (composite GOME-2 A&B)";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double
```

```
double GOME_lon(GOME_lat, date_GOME);
:standard_name = "longitude";
:long_name = "Longitude of GOME-2 acquisition (composite GOME-2 A&B)";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double
```

```
int GOME_date(date_GOME);
```

```

:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of GOME-2 A&B track";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

double GOME_SO2_1(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_low_troposphere";
:long_name = "SO2 vertical column density GOME-2 A&B low troposphere (2.5 km)";
:units = "DU";
:_FillValue = -9999.0; // double

double GOME_SO2_2(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_mid_troposphere";
:long_name = "SO2 vertical column density GOME-2 A&B mid troposphere (6 km)";
:units = "DU";
:_FillValue = -9999.0; // double

double GOME_SO2_3(GOME_lat, date_GOME);
:standard_name = "so2_vcd_gome-2_a&b_low_stratosphere";
:long_name = "SO2 vertical column density GOME-2 A&B low stratosphere (15 km)";
:units = "DU";
:_FillValue = -9999.0; // double

--CALIOP--
double CALIOP_lat(CALIOP_lat);
:standard_name = "latitude";
:long_name = "Latitude of CALIOP trajectory";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double

double CALIOP_lon(CALIOP_lat);
:standard_name = "longitude";
:long_name = "Longitude of CALIOP trajectory";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

Int CALIOP_date (CALIOP_lat);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of CALIOP trajectory";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

char CALIOP_filename (CALIOP_lat, CALIOP_char);
:standard_name = "filenamecal";
:long_name = "Name of CALIOP file";

double CALIOP_height (CALIOP_lat, Sensors)
:standard_name = "height_at_cloud_top";
:long_name = "Height of the VC automatic retrieval on CALIOP backscatter";
:note= "m from geoid surface";
:units="m";

```

```

:_FillValue = -9999.0; // double

double CALIOP_type (CALIOP_lat, CALIOP_char2, CALIOP_type)
:standard_name = "status_flag";
:long_name = "Type of the VC retrieved from the CALIOP Vertical Feature Mask";
:flag_values = 2, 6, 9, 10
:flag_meaning = "2=dust 6=elevated_smoke 9=volcanic_ash 10=sulfate/other"

--RADIO OCCULTATIONS--
double RO_lat(RO_lat, RO_profile);
:standard_name = "latitude";
:long_name = "Tangent point latitude of RO profile";
:units = "degrees_north";
:_CoordinateAxisType = "Lat";
:_FillValue = -9999.0; // double

double RO_lon(RO_lat, RO_profile);
:standard_name = "longitude";
:long_name = "Tangent point longitude of RO profile";
:units = "degrees_east";
:_CoordinateAxisType = "Lon";
:_FillValue = -9999.0; // double

int RO_date (RO_lat, RO_profile);
:_FillValue = -9999; // int
:standard_name = "time";
:long_name = "Datetime of RO profile";
:_CoordinateAxisType = "Time";
:units = "seconds since 1970-01-01 00:00:0.0";
:calendar="standard";

double RO_bending_angle(RO_lat, RO_profile);
:long_name = "Ionospheric corrected non-optimized bending angle of profiles";
:units = "rad";
:_FillValue = -9999.0; // double

double RO_anomaly_bending_angle(RO_lat, RO_profile);
:long_name = "Bending angle anomaly of profiles";
:units = "percent";
:_FillValue = -9999.0; // double

double RO_temperature(RO_lat, RO_profile);
:standard_name = "air_temperature";
:long_name = "Air temperature profiles";
:units = "K";
:_FillValue = -9999.0; // double

double RO_pressure(RO_lat, RO_profile);
:standard_name = "air_pressure";
:long_name = "Air pressure profiles";
:units = "Pa";
:_FillValue = -9999.0; // double

double RO_refractivity(RO_lat, RO_profile);
:standard_name = "refractivity";
:long_name = "Refractivity (N-units) profiles";
:units = "1";

```

```
:_FillValue = -9999.0; // double
```

```
double RO_specific_humidity (RO_lat, RO_profile);
```

```
:standard_name = "specific_humidity";
```

```
:long_name = "Specific humidity profiles";
```

```
:units = "kg kg**-1";
```

```
:_FillValue = -9999.0; // double
```

```
double RO_heightVC(RO_profile)
```

```
:standard_name = "height_at_cloud_top";
```

```
:long_name = "Height of the VC automatic retrieval on RO bending angle anomaly";
```

```
:note = "m from geoid surface";
```

```
:units="m";
```

```
:_FillValue = -9999.0; // double
```

## METADATA/Attributes

### Reference to literature

```
:volcano_name; // char
```

```
:VEI; // char
```

```
:eruption_start_day; // char
```

```
:eruption_end_day; // char
```

```
:volcano_lat; // char
```

```
:volcano_lon; // char
```

```
:retrieval_algorithm_AIRS; // char
```

```
:reference_1_AIRS; // char
```

```
:retrieval_algorithm_IASI; // char
```

```
:reference_1_IASI; // char
```

```
:reference_2_IASI; // char
```

```
:retrieval_algorithm_GOME; // char
```

```
:reference_1_GOME; // char
```

```
:reference_2_GOME; // char
```

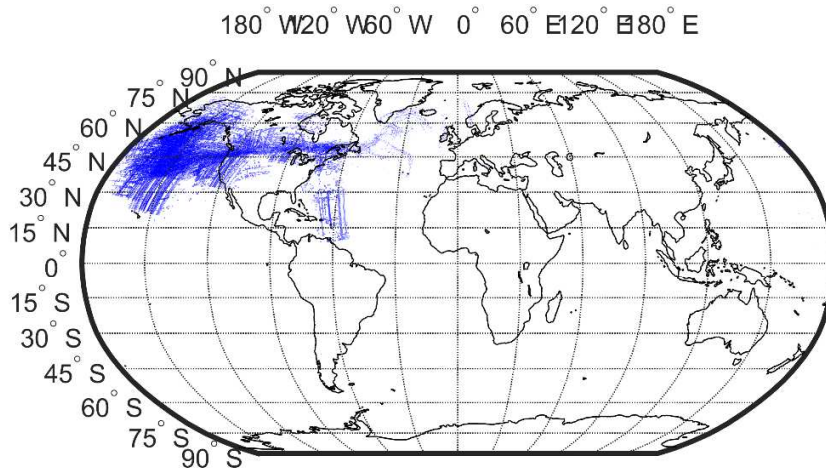


Figure S1. Okmok cloud map.

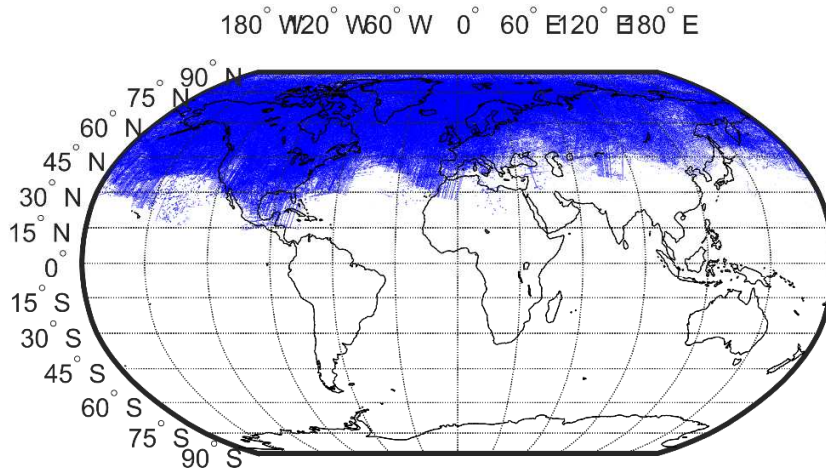


Figure S2. Kasatochi cloud map.

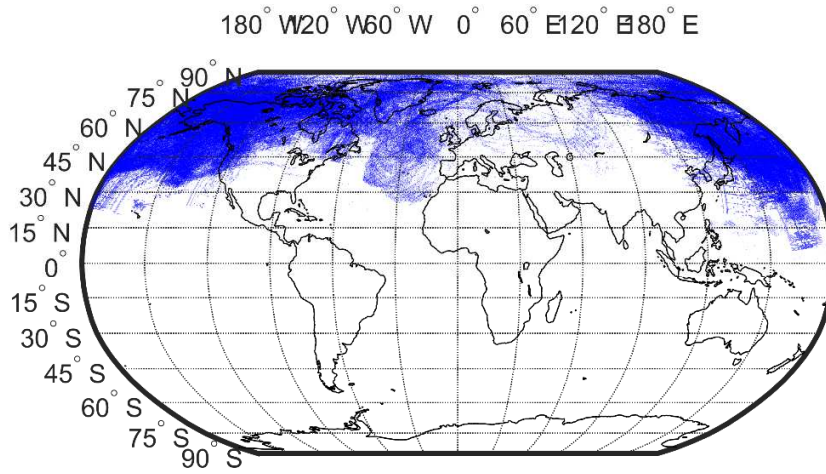


Figure S3. Sarychev cloud map.

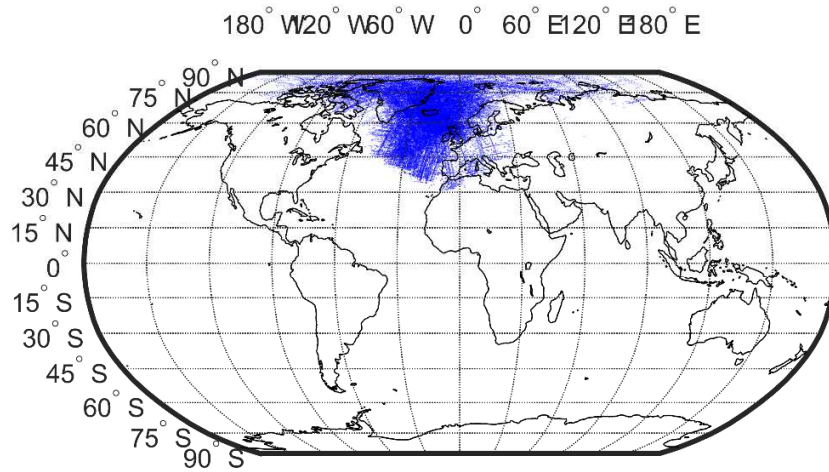


Figure S4. Eyjafjallajökull cloud map.

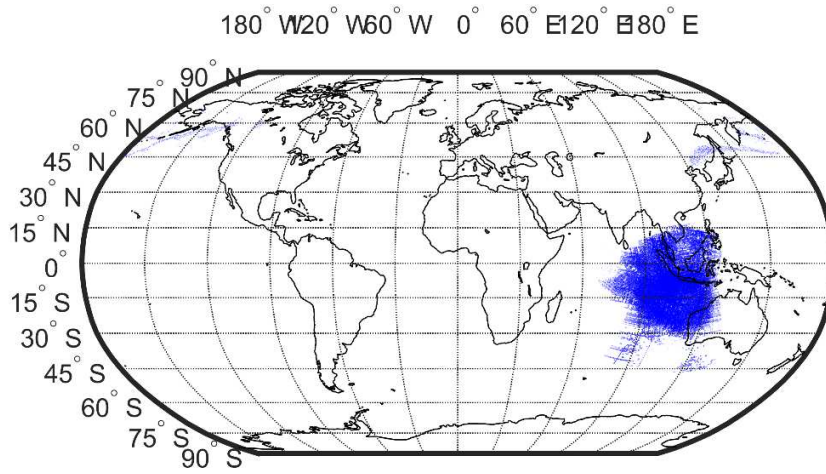


Figure S5. Merapi cloud map.

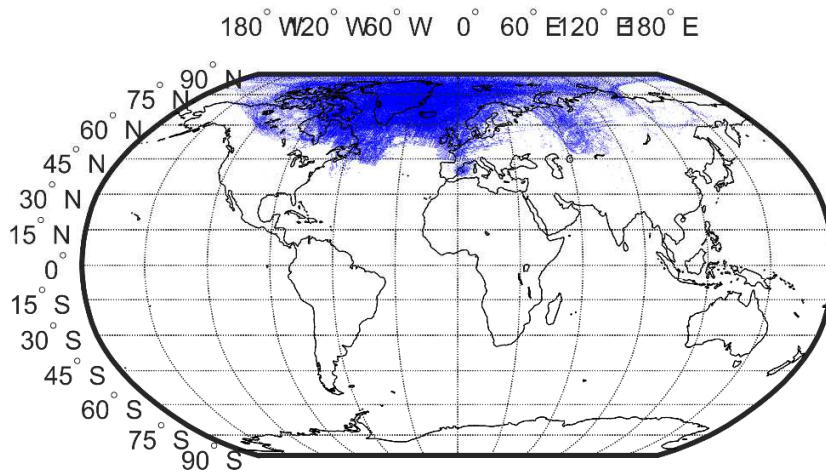


Figure S6. Grimsvotn cloud map.



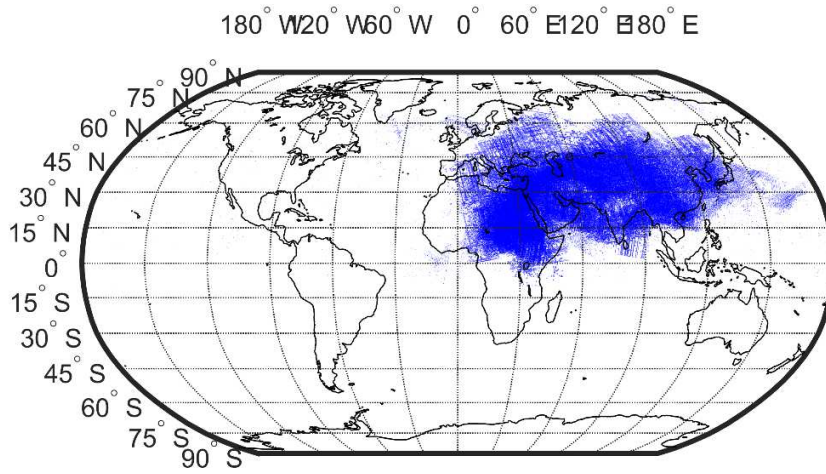


Figure S7. Nabro cloud map.

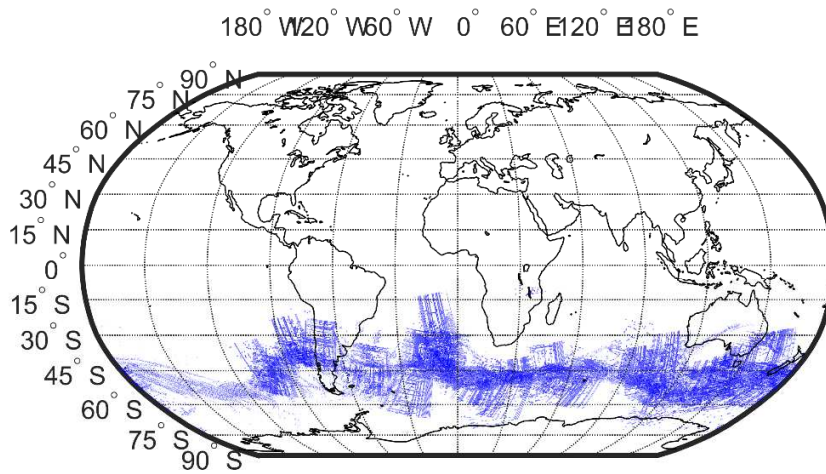


Figure S8. Puyehue Cordon Caulle cloud map.

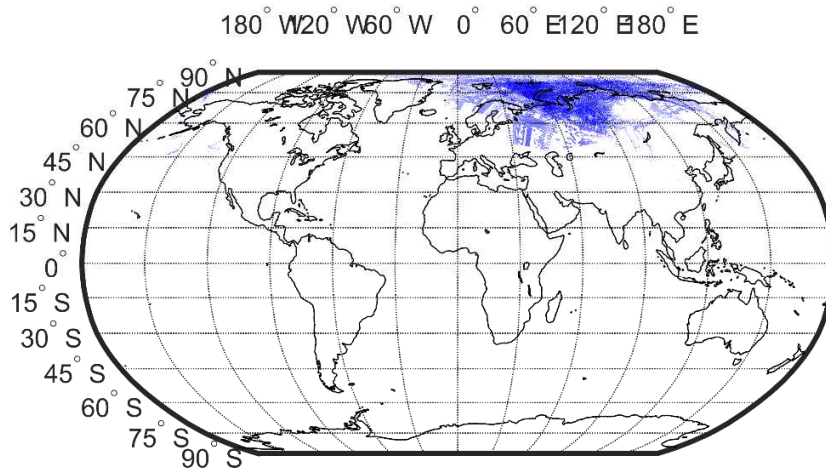


Figure S9. Tolbachik cloud map.

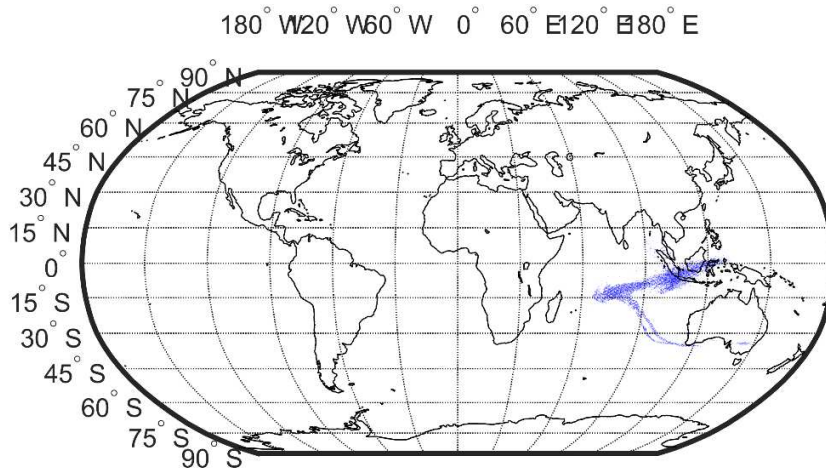
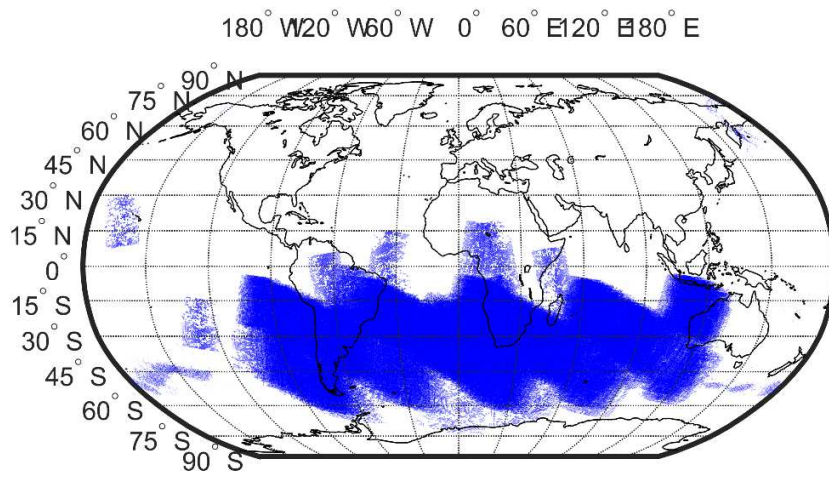


Figure S10. Kelut cloud map.



**Figure S11. Calbuco cloud map**